## Claims

- 1. An apparatus for detecting the hydrogen content of an object (101), wherein the apparatus (100) comprises
- a neutron source (103) that emits fast/energy-rich neutrons;
  - a detector device (102; 102a; 102b) for detecting thermal neutrons;
  - a moderator (104; 104'; 104") that brakes and reflects neutrons upon collision;

## characterised in that .

- said detector device comprises
  - a light-emitting unit (102b) that emits light in case of a nuclear event/reaction with a thermal neutron; and
  - o a light-registering unit (102a) that emits an electric pulse/an electric signal (106) when a flash of light is detected;
  - and that said moderator (104', 104") is a light-conductive unit arranged between said light-emitting unit (102) and said light-registering unit (102a).
- 2. An apparatus according to claim 1, **characterised in** that said light-emitting unit (102b) is a scintillator and that said light-registering unit (102a) is a photo-multiplier (PM) or a photo-diode.
  - 3. An apparatus according to claims 1-2, **characterised in** that said source (103) is comprised of or embedded in said moderator (104').
  - 4. An apparatus according to claims 1-3, **characterised in** that said source (103) is arranged essentially in proximity of or about/in the centre of the face of said moderator (104', 104") that adjoins the light-emitting unit (102b).

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5. An apparatus according to claims 1-4, **characterised in** that said light-conductive unit (104') is configured essentially with a face that adjoins said light-emitting unit (102b) and having a relatively smaller face adjoining a detection face (107) of said light-registering unit (102a).

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6. An apparatus according to claims 1-5, **characterised in** that said light-conductive unit (104") is configured for emitting light conducted from said light-emitting unit (102b) to the light-registering unit (102a) essentially perpendicular to a detection face (109) of the apparatus (100).

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7. An apparatus according to claims 1-5, **characterised in** that said light-conductive unit (104") is configured for emitting light conducted from said light-emitting unit (102b) to the light-registering unit (102a) essentially in parallel with a detection face (109) of the apparatus (100).

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8. An apparatus according to claims 1-7, **characterised in** that the apparatus further comprises an electric circuit (105) connected to said detector device (102; 102a), wherein said circuit (105) is configured for generating a signal (108) that represents an estimated amount of hydrogen, water and/or humidity content on the basis of the electric signal (106) from said light-registering unit (102a).

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- 9. A method of detecting the hydrogen content (101) of an object comprising the steps of:
  - emitting fast/energy-rich neutrons from a neutron source (103);
  - detecting thermal neutrons by means of a detector device (102; 102a; 102b);

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 braking and reflecting neutrons by collision of a moderator (104; 104'; 104"),

## characterised in that the method further comprises:

- emitting light by a light-emitting unit (102b) in the event of a nuclear event/reaction with a thermal neutron;
- emitting an electric pulse/an electric signal (106) by a light-registering unit (102a) upon recording of a flash of light; and
- conducting light from said light-emitting unit (102b) to said light-registering unit (102a) by a light-conductive unit arranged between said light-emitting unit (102b) ands said light-registering unit (102a); of which said moderator (104'; 104") is the light-conductive unit.
- 10. A method according to claim 9, **characterised in** that said light-emitting unit (102b) is a scintillator and that said light-registering unit (102a) is a photo-multiplier (PM) or a photo-diode.
  - 11. A method according to claims 9-10, **characterised in** that said source (103) is comprised of or embedded in said moderator (104').
  - 12. A method according to claims 9-11, **characterised in** that said source (103) is arranged essentially in proximity of or around/in the centre of the face of the moderator (104', 104") that adjoins the light-emitting unit (102b).
  - 13.A method according to claims 9-12, **characterised in** that said light-conductive unit (104') is configured essentially with a face that adjoins said light-emitting unit (102b) and having a relatively smaller face adjoining a detection face (107) of said light-registering unit (102a).

14.A method according to claims 9-13, **characterised in** that said light-conductive unit (104") is configured for emitting light conducted from said light-emitting unit (102b) to the light-registering unit (102a) essentially perpendicular to a detection face (109).

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15.A method according to claims 9-13, **characterised in** that said light-conductive unit (104") is configured for emitting light conducted from said light-emitting unit (102b) to the light-registering unit (102a) essentially in parallel with a detection face (109).

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16. A method according to claims 9-15, **characterised in** that the method further comprises generation, in an electric circuit (105) connected to said detector device (102; 102a), of a signal (108) representing an estimated amount of hydrogen, water and/or humidity content, wherein said generation is performed on the basis of the electric signal (106) from said light-registering unit (102a).